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Vascularization and chemotherapy: inferences from a simple model

Most of the models of chemotherapy are currently developed making only reference to the population of cancer cells. We propose to model chemotherapy taking into account the mutual interaction between tumor growth and the development of tumor vasculature. By adopting a simple model for this interaction, and assuming that the efficacy of a drug can be modulated by the vessel density, we studied the constant continuous and bolus-based chemotherapy, and combined therapies in which a chemotherapeutic drug is associated with an antiangiogenic agent [1]. The model allows to represent the vessel-disrupting activity of some standard chemotherapeutic drugs, and shows, in case of constant continuous drug administration, the possibility of multiple stable equilibria. The multistability suggests an explanation for some sudden losses of control observed during therapy, and for the beneficial effect of vascular "pruning" exherted by antiangiogenic agents in combined therapy.

References

[1] A. d'Onofrio and A. Gandolfi: Chemotherapy of vascularised tumours: role of vessel density and the effect of vascular "pruning", J. Theor. Biol. 2010, 264, 253-265.